

CptS 591: Elements of Network Science
Spring 2019
Semester Project
Assefaw Gebremedhin

Overview

The semester project constitutes a significant part of your work for this course (40% final grade). It offers a great opportunity to apply some of the things you learn in the course and to further explore a specific aspect. You are encouraged to work with one or two other student(s), forming a team of two or three, for the project. It is largely up to you to define the topic and the scope of the project as long as: the project clearly falls within the realm of the course, is likely to be doable within the remainder of the semester, and is reasonably novel and interesting (e.g. could form a basis for further research).

Project types

Roughly speaking, a project could be one of the following four types:

- Analysis of an interesting dataset using existing algorithms, models and measures. The datasets mentioned later in this document suggest possible domains to think about for your investigation, but you are also welcome to assemble your own dataset.
- Implementation of a new algorithm, model or measure and evaluating its performance on a collection of datasets.
- A theoretical project that considers an algorithm, a model or a measure in an area of this course, and derives rigorous results about it.
- A critical survey of a specific topic in an area of the course, going in some depth and offering a fresh perspective.

It is possible (and desirable) for a project to be a combination of some items among the four listed above.

Submissions

There are three submissions associated with a project: Reaction Paper (due March 18), Project Proposal (due March 25), and Final Report (due May 1).

Reaction paper

You get to pick two closely related papers to read for this part of the assignment. The papers you choose should be clearly related to the topics of the course; a chosen paper could, for example, be one of the further readings listed in the course's website or one of the papers cited in the reference books for the course, but it could also be a recent publication outside of these.

One of the goals of the reaction paper part of the submission is to help you generate a project idea for your proposal. If you already have a project idea, then you may choose the papers you read so that they have some relationship with your idea. (You will find this helpful later, when discussing related work in your final project report.)

You are to carefully read the chosen papers and write a short (2 to 3 pages) reaction paper on their content. The reaction paper should address the following points:

- **Summary:** What is the main technical content of each paper? How does each paper relate to the topics of the course? What is the connection between the papers?
- **Critique:** What are the strengths of the papers? What are the weaknesses of the papers and how could they be addressed? Were there any unrealistic assumptions made?
- **Further work:** What are some promising further research questions along the directions of the papers? How can the work be extended? Do you see an idea for a better model? A better algorithm? Another problem or data the methods of the papers can be applied to?

Proposal

Ideally your proposal will be an outgrowth of the further work part you brainstormed in the reaction paper. But your proposal might also be fairly detached from it, but that is fine—the reaction paper part is worthwhile on its own. As another source, I will also provide a list of project ideas from which you can choose and develop a proposal. The length of your proposal will depend on whether or not there is a direct relationship with your reaction paper. Roughly it should be 2 or 3 pages long. It should accomplish the following:

- Describe what you intend to do
- Describe the methods you plan to use or develop
- Describe the data you will use and discuss how you plan to obtain it
- Discuss relevant background work
- Discuss your tentative plan

Final report

The outcome of the project will be a final report of about 8 to 15 pages long. The nature and organization of the report will of course depend on the type of project undertaken, but its content should roughly map to the following rubric:

- Introduction/Motivation/Problem Definition
(where you state what you are trying to solve/achieve and why it matters)
- Model/Algorithm/Method
(where you give a detailed description of your work)
- Results and findings
(where you interpret the results you obtain, discuss implications, make observations and draw conclusions)
- Related Work
(where you cite (and briefly summarize) other work related to yours.)

Later in the semester, I will provide a more detailed guideline on how to write an effective final report.

Presentation

The last piece of the project will be a 12-minutes oral presentation in class by each group. The presentations are scheduled for April 18, 23 and 25.

Later in the semester, I will provide guidelines on how to prepare and deliver an effective presentation.

Datasets

The following cites have valuable resources on datasets (and software tools):

[Stanford Large Network Dataset Collection](#)

[Network data collected by Mark Newman \(University of Michigan\)](#)